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Role of Readers in Technical Communication

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The Role of Readers in Technical Communication

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Introduction: Surviving the Technological Era

In today's age of technology, large-scale scientific and technological advances are becoming more and more frequent. Many tools—once considered futuristic—are now a reality. Computer programs can now do our taxes and a surgeon can remotely perform open heart surgery from hundreds of miles away. However, many of the new tools introduced in our era may cause confusion and distress for end-users and engineers alike, especially when unaccompanied by proper documentation. This confusion ultimately results in the loss of time, money, and in extreme cases, human life.

Engineers who develop various technologies do not always fully explain the product's functionality, proper use practices, and inherent risks to end users. Users, on the other hand, do not always bother to explore the possible downsides of a technology, putting faith in the engineer's work and documentation provided with their product. Sometimes the end-user's and the engineer's desire to save time ultimately ends with both parties having to suffer the consequences.

To allow the end-users of a technology to safely and effectively apply a particular product to their needs, instructional texts usually accompany the product. For instance, many users may not know how to use image editing software like Adobe Photoshop without a manual. In fact, today most software companies like Apple and Microsoft provide documentation for their products.

While software documentation can be helpful and some users expect it, it is not necessarily vital in every case. Users may harmlessly fiddle with most software to figure out how it works usually

without harmful consequences. In other circumstances, though, proper documentation can mean the difference between life and death. A new mechanical addition to the floor of a machine shop can cause potentially fatal injuries if the writer of the documentation fails to address guidelines for proper operating procedures. Poor documentation or a lack thereof may even lead to disasters on massive scales.

Challenger and Chernobyl Disasters

Two particularly extreme examples, demonstrate the importance of clear communication between developers and end-users. The Challenger Disaster, which occurred on January 28, 1986, involved the breakup of a space shuttle 73 seconds after its launch. Seven crew members lost their lives that day. After thorough investigation, the Presidential Commission found that an O-ring, essentially a sealant, malfunctioned due to cold temperatures (Clark). Those in charge of the mission were misinformed about the inherent risks of launching on a cold day in January. Although memos to this effect had been sent by NASA's contractor, Morton Thiokol International (MTI), they had been misunderstood by NASA's management (Winsor 104).

The Challenger disaster shows that proper documentation involves honestly and clearly informing users of all safety precautions and the extent to which they should be considered. This incident also demonstrated the need for engineers to maintain active dialogue with those for whom they are designing and their own co-workers. While the Challenger incident occurred because the end-user—in this case the Marshall Space Center—misunderstood or ignored memoranda, sometimes product documentation is itself simply too confusing or ambiguous.

The Chernobyl nuclear reactor accident was the worst of its kind in history. On April 26, 1986, a steam explosion occurred at a nuclear power plant in Ukraine. When the steam explosion

occurred, it lifted the cover plate of the reactor, “releasing at least five percent of the radioactive reactor core into the atmosphere” (World Nuclear Association). The initial incident killed 30 people, including 28 who died of radiation exposure, and contaminated large areas of Ukraine, Belarus, Russia, and some more distant parts of Europe. As of 2004, there have been a total of 56 fatalities due to the accident, including those who died of cancer years later (World Nuclear Association).

Although engineers investigating the Chernobyl accident could only theorize as to the real cause of the incident, one theory was rooted in poor communication while another blamed the catastrophe on design flaws in certain parts of the reactor. One thing all investigators agreed on was the lack of operator training on the day of the accident. Operators were not aware of safety guidelines which could have prevented the incident (World Nuclear Association).

Even if the reactor had design flaws, the designers needed to alert those operating the nuclear reactor about any extra safety precautions. The instructions compiled for the reactor operators were also unclear, as the writers crossed out some procedures making the documentation somewhat incomprehensible (Legasov). Without clearly defined safety procedures and a lack of well-established experimental protocols, it was not a question of whether the reactor would explode but when it would happen.

The Challenger and Chernobyl disasters may seem like radically rare examples of the problem of miscommunication, but in reality people waste time and companies lose money every day because of poor documentation. Engineers are apt creators of technologies, but when a new piece

of technology is created, it is akin to creating a new language, particularly one that is not familiar to users.

Technology as a Second Language

Technology, like a language, has certain requirements which must be met and rules which must be followed in order to correctly and safely use it. Every language has rules, a way to apply those rules, and a context within which it is used. For instance, formal English is reserved for professional settings like workplaces while informal English is used in casual locales like the company of friends. Similarly, with a new technology comes a new method of applying it, or a way to put the technology into action in order to accomplish a specific task.

In the end, every speaker of a language must agree on established guidelines. Thus, when an engineer creates a new technology, he or she should clearly define its rules, a method for applying the rules, and the context, or the intended purposes and uses of the technology. Since engineers already speak the language of their product, some of them may assume their end-user population knows it, too. Engineers may have trouble properly relaying information about their product to their users without translating their language into one both the engineer and user can easily comprehend. By using a shared language, the engineer and end-user can reach a mutual understanding. In addition, users may be operating in a different context with different needs, and engineers may not only need to adapt their language but even the technology itself to better meet user needs. Users and developers need to understand each other in order for the technology to be user-friendly.

Rise of the Technical Writer

As the caliber and complexity of technology grows, so does the need for greater explanation and clarification. Enter the Technical Writer. This type of profession found its niche in the 20th century. Technical Writer is now an important, albeit sometimes undervalued occupation. CNN Money reports Technical Writer at number 13 in the top 50 jobs in America today. The technical writer's responsibilities vary, and may include documenting operating procedures for devices or pieces of software, designing and implementing online help documents, and composing training documents for new employees. The engineer is the one who designs technology while the technical writer is the one who makes it accessible to users.

A Brief History of Technical Communication

As early as the late 1930s to mid-1940s, professionals in society began to recognize the importance of technical communication. Frederick M. O'Hara Jr., a private consultant in technical communication, points out in "A Brief History of Technical Communication" that the Second World War was a chief contributor to technological advances during the early 20th century. During World War II, "Technical Writer" was recognized as a real job title. In the field of weapons, medicine, communication, and many others, war became a reason to advance at a much quicker pace if the United States wanted to stay ahead of its enemies. Chemical warfare became widespread and the Medical Corps was required to treat malaria in the jungles of Panama. War also helped to propel the Air Corps's aviation design programs. With the arrival of such a fast-moving industrial revolution, came the need for training, standardization of procedures, and instructional manuals (O'Hara 2).

According to the Society for Technical Communication website, in the 1950's and 1960's, several technical communication societies were formed in the United States. In 1960, the largest professional, technical writing society in the world was born from the merger of the Society of Technical Writers and Editors (STWE) and the Technical Publishing Society. The new organization was named Society for Technical Communication, or simply STC. The STC was initially made up of engineers who wrote documentation in addition to fulfilling their other professional duties. With the arrival of the internet, and as technology advanced further, the need for more in-depth understanding of technology became a reality (STC.org).

Just as technical communication started to pick up momentum in the professional world, one of the most prominent technologies in history began to permeate American society. In a post-war era, the computer helped to fuel the newly emerging consumer world. Providing a higher level of organization, higher efficiency, and more productivity in the workplace, the computer helped to drive the booming economy in the latter half of the 20th century.

Fortunately for the eager technical writer, the computer also created new jobs. With this new technology came the need for installation manuals, troubleshooting guides, operational instructions, and other documents helping to integrate the computer into everyday life. Technical writers soon began populating the workplace and refining their craftsmanship.

"Technical Writer" Becomes a Profession

As of 2006, the Bureau of Labor Statistics reported a total of 49,000 technical writers employed in this country, with a projected employment of 59,000 by 2016. According to Gradschools.com, nearly 40 universities in the United States now offer graduate programs, both Master's and Doctorate, in the Technical Communication field.

Most of these programs combine the study of composition and rhetoric with technological aspects of the profession. For example, the Professional Writing major at WPI requires a student to fulfill six units of sciences and three units of writing and rhetoric. Some technical writers in training may choose to study human-computer interaction in order to understand how one of their potential audiences, namely computer users, behaves in certain technical settings. Others may choose to study computer graphics and the rhetoric of visual design to learn how visual cues can complement the documentation they will compose on the job. Through studying rhetoric as it relates to various technologies, technical writers are better prepared to address the users of those technologies.

Another example of such a program is at Rensselaer Polytechnic Institute's (RPI) School of Humanities and Social Sciences. There students have the opportunity to receive a Master of Science degree in Technical Communication. In addition to studying rhetorical theory and refining composition skills, students at RPI "acquire knowledge of information and product usability, product design, [and] rapid learning of electronic tools" (RPI.edu). The master's degree at RPI involves 15 credit hours of electives, encouraging students to choose from communication, marketing, and software engineering courses (RPI.edu).

One of the largest concerns technical writers are taught to consider when writing a document is their intended audience. Indeed the concept of addressing an audience is one that rhetoricians have discussed for thousands of years in many forms because it is at the heart of adapting information to specific readers in specific contexts. It is only in the past century, however, that audience discussion in relation to technical communication has arisen.

Importance of Audience throughout History

In this study, I compare and contrast the ways in which audience has been defined in rhetorical studies, in recent technical writing textbooks, and by working technical writers. I examine the view of audience of several prominent scholars of rhetoric, such as Aristotle, a well-known classical rhetorician who shaped the field. Also, I look at the works of other rhetoricians in recent years. I examine how audience has been introduced in two recent, popular technical writing textbooks. Finally, I interview three working technical writers in order to define and understand the practical aspects of audience. The particular questions I answer are:

- How do rhetorical theorists, instructors, and practitioners define the role of audience in technical communication?
- How does each group explain the relationship between writer and audience—the way these parties do or should collaborate or interact?
- How might these various models of audience apply in the context of writing technical documentation for users?
- Are there gaps between theory and practice?

By conducting interviews with working technical writers and examining literature on the role of audience in technical communication, this project identifies potential gaps between the theories of rhetoricians and the practices of technical writers. Therefore, my findings may benefit technical writers in the profession, rhetorical theorists, and technical writing teachers alike. Discovering gaps between the theory of audience and its meaning in practice may help to create new ideas and areas of research on the importance of audience.

As an undergraduate Professional Writing major at Worcester Polytechnic Institute who is going into the field of technical communication, I also hope that this project will aid me in making better decisions in the course of my career. Studying both the theory and the practice behind composing helpful documents will allow me to design better technical documentation and to promote safety in the use of technology.

Rhetorical Models of Audience and Communication

Rhetoricians have argued for various definitions of rhetoric throughout history. Plato described rhetoric as the art of "[leading] the soul by means of words" (Phaedrus 261a). Quintilian defined rhetoric as "the art of speaking well" (Institutes of Oratory). Aristotle spoke of rhetoric as "the faculty of discovering the possible means of persuasion in reference to any subject whatever" (Art of Rhetoric 15). All of the aforementioned definitions share two important aspects: each definition of rhetoric incorporates the concept of audience and the concept of communication.

The Orator's Audience

In Aristotle's time, rhetoricians limited their study of communication to speeches, delivered orally in front of a crowd of people on the street, a group of legislators, or a gathering of court officials. Communication was portrayed as a wholly one-way street—an oral monologue—from the orator to the audience. In Athens, the elite audience members who participated in public rhetoric were usually propertied, educated males. Since speakers addressed a fairly homogenous audience with generally similar beliefs and ways of thinking, they knew how to appeal to and persuade their listeners by resorting to shared beliefs. If at the conclusion someone was unclear

about any part of the persuasive speech or resisted the ideas, then the rhetorician had not done his job efficiently. Aristotle's view of communication in rhetoric necessarily portrays the audience as passive participants—they are acted upon as the receivers of communication.

Aristotle's model of audience implied that listeners of speeches would not directly involve themselves in the creation of content but simply judge that content after the fact. The rhetor was the focus, and his knowledge and ideas were privileged. In a way, the audience became the student of the speaker, never contributing to the speech itself but simply receiving the information. In classical rhetoric, "The search for knowledge was accomplished before the rhetorical act" (Porter 18). Aristotle also refers to this idea of the rhetor's being in charge of the oratory quite obliquely in Book One of the *Art of Rhetoric*. "Our proofs and arguments must rest on generally accepted principles," says Aristotle. If there are only generally accepted principles, then there is no need for the audience to question the orator and participate in the creation of knowledge.

In Aristotle's time, speeches were the type of communication studied by rhetoricians, and the audience was used as a mental construct, something to help the rhetor refine his ideas and evidence. Real audiences themselves, however, might actively contribute to the rhetor's conclusions or how the rhetor might seek their input early in the process of writing a speech.

Mass Media Reshapes Theories of Communication and Audience

Today, multimodal communication is forcing rhetoricians to rethink theories of communication and audience. With the emergence of mass printing and online publications, writing has become one of the most widespread modes of communication. Other media like the internet and blogs have also transformed the nature of communication. In virtual chat rooms, people from all over the world can gather, interact, and share their ideas. On blogs, experts in particular fields can

answer questions and help others solve problems. The main difference between the way theorists treated rhetorical communication in Aristotle's time and today: the theory of communication now accommodates a reader-writer relationship that is dialogic.

Theories of Audience in the 20th Century

As a result of such advanced technologies, the potential audience of a single piece of discourse has grown in size considerably. Today, a writer can reach a multitude of audiences, all members of which may have different attitudes and beliefs. Ubiquitous multimodal discourses like the television and internet have also increased the potential size of the audience of a single orator. The audience is no longer contained within a single space or time as it was in Aristotle's time. An individual who was not present to hear a speech because of another engagement in another part of the world may view it at a later time on TV.

With so many technological commodities, there is greater flexibility in the roles audience can play in rhetorical communication. An audience can still play the role of listener, but can also take on the role of a viewer, reader, participant in rhetorical discourse, or even a writer, in the case of online blogs. A greater variety of audiences, however, also means rhetoricians need to choose wisely which ones to address and how to do so.

Addressing large audiences is difficult because rhetoricians might have to tailor the speech or written work to match the rhetorical needs of several diverse audiences. In a political speech, energy suppliers may wish to hear how new policies will affect their business whereas environmental protection agencies want to know about the potential harmful consequences our planet may face. Many particular potential audiences exist, and some contemporary rhetoricians, such as Andrea Lunsford, Lisa Ede, Robert Johnson, and Walter Ong have tried to redefine audience and the way writers think about and interact with their readers.

There are several central concepts rhetoricians in the past 40 years have used to define audience, paying special attention to the roles and relationships between rhetoricians and the audiences they address. Rhetoricians like Walter Ong say that a writer imagines the audience when writing and brainstorms some of the characteristics an audience may exhibit in real life. Andrea Lunsford and Lisa Ede call this imaginary construct an "invoked" or "imagined" audience, and Ong refers to it as "a fiction". Lunsford and Ede think considering actual existing populations may help a writer to compose a more effective document; they define this type of audience as audience "addressed". A third type of audience is one Robert Johnson terms the "involved". An involved audience is not just some concept in the writer's mind but instead a real group of people who collaborate with a writer to compose a document. One thing all rhetoricians can agree on is that audience greatly affects what the writer will put down on paper.

Audience Addressed

Modern rhetoricians Andrea Lunsford and Lisa Ede coined the concepts of the addressed audience and the invoked audience. In discussing "Audience Addressed/Audience Invoked: The Role of Audience in Composition Theory and Pedagogy," they say that people who see audience as real, actual readers who will read, listen to, or view a piece of discourse, are considering "audience addressed" (Lunsford & Ede 156). These people assume that actual readers can be analyzed and this will help them to compose a text more likely to persuade them. The two rhetoricians say that "knowledge of [the] audience's attitudes, beliefs, and expectations is not only possible (via observation and analysis) but essential" (156).

Lunsford and Ede suggest making the text more reader-oriented and to avoid two writer-oriented composition models. The "writer model" is a scenario in which writing is seen as a form of self-expression, or simply a way for the writer to creatively express his or her own thoughts with no

regard for readers. Lunsford and Ede explain that one of the limitations of the "writer" model "is its emphasis on the self, the person writing, as the only potential judge of effective discourse" (158). In the "writer" model, the writer's content is motivated by his or her own purposes and desires without particular regard for readers. By taking the alternate route of using the theory of addressed audience, "the audience [then] not only judges writing; it also motivates it" (158) because the writer considers certain audience needs while writing.

Lunsford and Ede also discuss the "written product" model, in which local composition issues are stressed, such as grammar and punctuation, as a way to make a text more understandable for an audience. The problem with using this model in practice is the inability of writing teachers as well as writing professionals to agree on the correct usage of such "intrinsic features" as commas and fragments (157). There is no consensus on what is "good" writing, so writers may turn to the audience as judges of the effectiveness of their composition. Even the quality of certain surface features like comma use depends on the audience's particular expectations. When students begin to realize how their audience reacts to their use of such features, they may be able to improve their writing to better address that audience.

However, Lunsford and Ede warn rhetoricians and teachers alike not to stray too far away from the two writer models. Allowing only readers to decide what is "good" and what is "bad" writing may take away too much power from the writer, who should re-read his or her own writing and decide whether it really is effective. Lunsford and Ede recognize that readers "actively contribute to the meaning of what they read" (158) but stress that writers should conversely play the role of readers of their own writing. Hence, the addressed audience is not one with full power to decide the content of a document, but rather one that is considered as a collaborator. Lunsford and Ede

describe the role of the readers and writers as such: “There are really not one but two contexts for rereading: there is the writer-as-reader's sense of what the established text is actually saying, as of this reading; and there is the reader-as-writer's judgment of what the text might say or should say” (158).

They suggest that writers can analyze a particular group they wish to address and create mental images of them by asking themselves questions about those readers concerning their attitudes, expectations, prior knowledge, and the environment in which they will read the text. Writers should also determine the relationship between themselves and their readers.

Fred Pfister and Joanne Petrick suggest a “Heuristic Model for Creating a Writer’s Audience,” in which there are certain questions writers may wish to ask themselves when composing a document:

- What is my purpose(s)/aim(s) in addressing this audience?
- Is this an appropriate audience for this subject?
- What is [the reader’s] physical, social, and economic status? (age, environment, health, ethnic ties, class, income)
- What is [the reader’s] educational and cultural experience?(especially with certain patterns of written discourse)
- How much does the reader know about what I want to say?
- What level of syntactic sophistication [should I use]?
- What is the role I wish to assign to the audience? What role do I want to assume for the audience? (Pfister & Petrick 214)

Asking questions like those suggested by Pfister and Petrick helps a writer to keep the text reader-oriented. The writer's purpose should be shaped not only by his needs and purposes but also by his readers. The question is not "Why should I write?" but rather "What does my audience wish for me to address?" Researching the reader's background allows a writer to fulfill the purpose more accurately. Finding out how much readers already know about the writer's topic will ensure the writer does not address topics about which readers already know. Keeping a text reader-centered stops writers from composing for themselves and thus becoming the only audience of the text.

After analyzing audience members, the writer can sit down with an image of the concrete audience in mind, knowing that the audience for whom he is writing truly exists. Such a mental construction of the audience allows a writer to come as close as possible to writing to a present audience without actually having readers stand over his shoulder, reading every word to make sure they understand everything.

Lunsford and Ede explain that in order to accurately address an audience, the writer must first determine the roles readers will play. "[The writer]… would need, as one of the many conscious and unconscious decisions required in composing, to envision and define a role for the reader" (Lunsford & Ede 164). One real-world example of writers constructing roles for readers is seen in the classroom of any given high school.

> Students become angry or discouraged with both the grade and the often not-too-helpful remarks they find scribbled on their papers when they are returned by composition teachers, and [teachers] should not blame them in the least. Those students who do write

> successfully for [teachers] often do so because they know [teachers] and can write successfully for the audience of one—the teacher. (Pfister & Petrick 213)

In this case, the student assigns the role of "grader" to the teacher. The student then proceeds to write defensively, making sure to address every point the teacher may wish to hear. The points the student addresses are not necessarily meant to interest the teacher, however, but rather to almost argue for receiving a good grade. *I know the material and here is the evidence to support that*, the student may reason.

The problem arises when the teacher plays a different role than the one the student assigns to him or her. Teachers may wish to learn from the student's paper instead of reading a regurgitation of incoherent, useless facts. When the assigned and actual roles clash, conflict arises as both the teacher and the student are disappointed with the content. Consequently, the student must reassign a different role to the teacher to match her role as just another interested reader.

The concept of an addressed audience emphasizes that a standalone text is not important until a reader interacts with it. In fact, some rhetoricians claim that the meaning in a document is flat-out inexistent until a reader engages it. Stanley Fish and Wolfgang Iser believe that since the reader is indeed the reason for the production of a text, a text without a reader is just a piece of paper. In *The Implied Reader* Fish and Iser write:

> The work is more than the text, for the text only takes on life when it is realized, and furthermore the realization is by no means independent of the individual disposition of the reader-though this in turn is acted upon by the different patterns of the text. The convergence of text and reader brings the literary work into existence, and this convergence can never be precisely pinpointed, but must always remain virtual, as it is

> not to be identified either with the reality of the text or with the individual disposition of the reader. (Fish & Iser 274-75)

According to Walter Ong, writers rarely "cast", or imagine, readers in roles actually corresponding to their roles in life, either professional or social (Ong 12). Writers often assign roles to readers—have them perform certain tasks and subscribe to certain views, which they would never perform or to which they would never naturally subscribe. In doing so, they fictionalize their audiences.

Indeed, even analyzing a real, existing audience still means the writers must use the imagination. Fred Pfister and Joanne Petrick also comment on the addressed audience, saying that there is no way to avoid imagining readers even if they are real, existing humans. Writers addressing real-world readers still "must construct in the imagination an audience that is as nearly a replica as is possible of those many readers who actually exist in the world of reality and who are reading the writer's words" (Pfister & Petrick 214).

Invoked Audience

In contrast to an addressed audience, Lunsford and Ede explain that an invoked audience is one that remains literally unanalyzed, and is an invention in the writer's mind based on prior experiences and assumptions. In the case of invoked audience, the writer uses "semantic and syntactic resources of language" (Lunsford & Ede 160) to provide clues for readers as to which role they should play in response to the text.

Writers who do not face a real audience like an orator often invoke, or imagine, an audience. In "The Audience is Always a Fiction", Walter Ong argues that it is impossible for a writer to really have an audience in the traditional rhetorical sense of the term.

> The problem is not simply what to say but also to whom to say it. Say? The [writer] is not talking. He is writing. No one is listening. There is no feedback. Where does he find his 'audience'? He has to make his readers up, fictionalize them. (Ong 9)

Ong carries on a conversation with himself while debating whether the writer can truly address a reader without painting a fictional portrait of that reader.

Ong says that the definition of rhetoric has broadened over time to include various new modes of communication, but the original definition was only concerned with the spoken word "as is indicated by its name [rhetoric], which comes from the Greek word for public speaking" (9). Therefore, transferring the definition of audience from oratories to writing without at least partly changing its meaning is nonsensical. The same degree of communication cannot be achieved, according to Ong, through writing as through conversation or oratory. One reason for this is the lack of the context, in writing, established between two people when they talk face to face.

Writing can, in most instances, reach an immense number of readers. Ong describes the power of the written word as "A surface inscribed with information [that] can neutralize time by preserving the information and [conquer] space by moving the information to its recipient over distances that sound cannot traverse" (10). Writing is not, however, a two-way street as a live conversation can be. The audience initially reads and reacts to the text on their own, usually in the same level of isolation as the composing writer (16).

In contrast, an oratory can only reach a limited few, since "the spoken word is part of present actuality and has its meaning established by the total situation in which it comes into being" (10). Ong goes on to describe such a situation where people are present and interacting as the "present circumambient actuality" (10). One example Ong gives of the difference between writing and

speech is of a person writing a letter to a friend. The letter writer has to imagine the type of mood his friend is currently in. In face-to-face conversation, it is possible to guess the type of mood someone is in, but a letter writer must assign a mood to his or her reader. The reader is then forced to take on that mood while reading the letter (19).

Since writers do not have a concrete audience in the sense that speakers have an audience, Ong concludes that a writer can never directly address a reader. "Direct communication by script is impossible," says Ong (20). Ong makes a distinction between the term "reader" and "audience". The audience is a collective entity that exists "here and now" (11) in front of a speaker while readers can be diverse both in space and throughout a period of time. The term "readership" is completely abstract and vague, according to Ong, but audience as a group of people listening to an orator are very much real (11); they have the ability to interact with one another and the orator. It is this abstract concept of a reader, which is indeed just a concept to Ong, that he uses to support his claims that an audience must be fictionalized. After all, such an abstract concept can only be fathomed in one's imagination.

The main difference between an invoked audience and an addressed audience is that invoking an audience, in Ong's definition at least, entails imagining a group of potential readers who do not exist. "The writer must construct in his imagination, clearly or vaguely, an audience cast in some sort of role—entertainment seekers, reflective sharers of experience…and so on" (Ong 12). In addition, readers do not even have the ability to "play" themselves in an invoked model because they must "fictionalize themselves" (12) in order to play a role corresponding to the one the writer imagines. Only by having the reader play the correct imagined role can the writer truly address any real, existing reader.

Rhetoricians like Ong, who say that the reader is always invoked, are striving toward a reader-centered mode of writing. Unfortunately, the technique of imagining an audience just strays farther away from a reader-centered approach. The invoked audience model actually reverts back to a reader-writer model in which the writer possesses most or all of the power to determine the content of a document. All that matters is what is in the writer's head and whether the reader can identify the types of audiences the writer is trying to address in a document and consequently play those roles.

What happens when a reader does not behave in the way the writer imagined? If the roles readers play are different from those assigned by writers, then it is also likely that the image writers construct of their readers could be inaccurate. Hence, fictional representations of readers, while helpful, may mislead writers about the true characteristics of their audiences. If a writer imagines the reader as a moderately knowledgeable individual, who already knows a bit about the writer's topic, then his composition may not contain enough description for actual readers who may not know anything at all about the topic. Russell Long fears that the reader will become just that—a fiction. In his article entitled "Writer-Audience Relationships: Analysis or Invention?" he writes:

> If audience is a created fiction, then an analysis of its traits becomes possible only as the writer defines his purpose and decides upon desirable reader characteristics. The widespread assumption that audience analysis leads to tactical decisions is reversed; a writer's choice of alternatives determines his audience; that is, his decisions create a very specific reader who exists only for the duration of the reading experience. In short, this literary theory of writer-reader relations seems at every point to contradict or reverse the traditional rhetorical assumptions about audience. (Long 225)

Making the audience a fiction is risky because all of its characteristics—attitudes, beliefs, knowledge—may become fictional as well. A fictional audience also makes for a very impersonal relationship between the writer and reader, and a very hierarchical one in terms of the amount of power each possesses to contribute to a document. Various rhetoricians have suggested several alternatives, however, which writers can employ in an attempt to avoid the dangers of addressing the wrong audience.

Lunsford and Ede expand on Ong's theory in pointing out that he oversimplifies the rhetorical situations of written and oral communication. There are many types of audiences, not all of which necessarily have the opportunity to interact with one another or are concrete concepts in writers' minds. Most readers of mass media both in print and on the internet, for instance, probably never see each other face to face. Even the members of a speaker's audience do not necessarily have the opportunity to interact with one another. In "Audience Addressed/Audience Invoked: The Role of Audience in Composition Theory and Pedagogy," Lunsford and Ede mention three types of audiences to illustrate the concept of interaction: the so-called "active, occasional audience", which attends and actively participates in discussions of oratories, the "passive, occasional audience", which simply gathers to listen to a lecturer's talk, and the "pedestrian audience", which consists of people who happen to pass a "soap box" orator and hear his or her speech (Lunsford & Ede 161). While the active audience is interactive, the other two are more like the separated audience of mass media. Lunsford and Ede say that there is too much of a distinction between oral and written discourse to make generalizations like Ong's.

Writers who "invoke an audience" may take too much power for themselves. According to Lunsford and Ede, "Readers' own experiences, expectations, and beliefs do play a central role in their reading of a text, and…the writer who does not consider the needs and interests of his audience risks losing that audience" (165). If the writer only incorporates his or her own experiences, expectations, and beliefs into a document or imposes a role that audiences may wish to resist, there is a great risk of failing to effectively write for readers.

How does a writer avoid the risk of writing for him or herself and ignoring the readers' needs? Ong considers it impossible and impractical for a writer to consider every single reader of the audience. "It would be fatuous to think that the writer addressing a so-called general audience tries to imagine his readers individually….It may be, of course, that at one time or another he imagines himself addressing one or another real person. But not all his readers in their particularities" (Ong 10). How could writers avoid delving into each particular characteristic of every potential reader? What follows is a description of two theories of audience, one suggesting the generalization of audience, and another the elimination of it altogether.

The Audience is Everybody: The Universal Approach

Rhetoricians have suggested the fictionalizing of audience by creating one large fictionalized one. This involves including the correct content to satisfy the shared needs of all sub-audiences within the larger one. Rhetoricians Chaim Perelman and Lucie Olbrechts-Tyteca based their theories on the belief that addressing everyone who may happen to read the document in any time and place is a safe technique. By considering such a large audience, the writer cannot possibly omit information the actual intended audience desires.

Perelman and Olbrechts-Tyteca, who wrote *The New Rhetoric*, claim that targeting a particular audience is risky when writing a composition. "By the very fact of adapting to the views of his listeners, [the speaker] might rely on arguments that are foreign or even directly opposed to what is acceptable to persons other than those he is presently addressing" (Perelman & Olbrechts-Tyteca 31). A rhetorician's clever opponent need only present the rhetorician's own argument to a different interlocutor in the audience for whom it was not intended, and perhaps to whom it is offensive. Instead, the rhetoricians suggest addressing a universal audience—an audience that shares a common set of knowledge, beliefs, and attitudes—when composing a piece of discourse.

Perelman and Olbrechts-Tyteca believe a universal audience must exist because "audiences are not independent of one another, [and] that particular concrete audiences are capable of validating a concept of the universal audience which characterizes them" (35). Members of a universal audience all have three very general similarities. Everyone in the audience has an understanding of what is true, what is real, and what is objectively valid (33). The writer must build his arguments on those understandings in order to persuade the large audience.

An able writer must use such arguments so as to express general truths valid for all people—the living, the dead, and those who may live in the future. "Argumentation addressed to a universal audience must convince the reader that the reasons adduced are of a compelling character, that they are self-evident, and possess an absolute and timeless validity, independent of local or historical contingencies" (32). Appealing to a universal audience does not necessarily entail appealing to all of humanity, only to all those humans who *wish* to read or will ever *happen* to stumble upon a text. Even though Perelman and Olbrechts-Tyteca presented a very broad view of audience, they did not completely reject the idea of particular audiences.

To support their theory of a universal audience, Perelman and Olbrechts-Tyteca believed in the interconnectedness of all specific audiences. In their opinion, various audiences with different rhetorical needs all share at least some beliefs or attitudes with the rest of the larger, more comprehensive universal audience. Therefore, if a rhetorician could speak such truths so as to convince the universal audience, he would address each particular audience as a result.

While rhetoricians like Perelman, Lunsford, and Ong propose that writers consider the incorporation of audience into the writing process, there are others who insist that it is useless to consider any type of audience—particular or universal—and will actually inhibit the writer's creative juices. One such group of rhetoricians is known as the Expressivists.

The Audience is Nobody: The Expressivist Approach

Expressivists argue that writers should work on developing their own writing style and ability to generate content without too much consideration of what others think. Their view of the writing process strictly revolves around the writer pleasing oneself, and indeed becoming one's own audience. Peter Elbow, Donald Murray, and E.B. White argued for abandoning considerations of audience all together. Expressivist rhetoric is mainly concerned with promoting a writer's unique expression through an original voice or style. Audience is a trivial and rather bothersome concept to Expressivists; it rather gets in the way of the writer's creativity.

> When I am talking to a person or a group and struggling to find words or thoughts, I often find myself involuntarily closing my eyes as I speak. I realize now that this behavior is an instinctive attempt to blot out awareness of audience when I need all my concentration for just trying to figure out or express what I want to say. (Elbow 50)

The Expressivist outlook on rhetoric encourages the writer to satisfy himself without stressing out about appealing to an audience. In fact, Elbow believes that taking the audience into account can lead to severe cases of writer's block.

While some audiences can be inviting, opening our minds to new possibilities when writing, others are inhibiting. As mentioned earlier, a student writing for a teacher may write defensively, thinking about the teacher's potential criticisms of every single word of every sentence (51). Elbow fears that this stress will hinder a writer's progress. The writer should instead ignore the audience or purposefully write for the other, more inviting one. In the former case, a writer can apply a cognitive technique known as the "Desert Island Mode" (56).

In Desert Island Mode, a writer relies on inner reflection to compose a rhetorical piece. Expressivists like Elbow see it as a weakness if a writer cannot begin writing—perhaps free-writing—without first thinking about audience. Instead of relying on audience to get started, a writer must work on developing one's own ideas, writing skills and styles. In the eyes of Expressivists, to think of audience first is to lack one's own personal thoughts.

Another main problem Elbow sees with considering audience—apart from its interference with the flow of creative juices—is a writer's inherent failure to address the *correct* audience.

> For even if all discourse is naturally addressed to some audience, it's not naturally addressed to the right audience-the living readers we are actually trying to reach. Indeed the pervasiveness of past audiences in our heads is one more reason for the difficulty of reaching present audiences with our texts. (61)

In essence, Elbow is arguing that writers, no matter how much they wish to address a particular audience, will always end up missing the mark. The preceding argument can be used to further

complicate Walter Ong's as well as Lunsford's theories about audience analysis. Elbow could potentially argue that by imagining or even analyzing an audience, a writer could err and address the wrong audience(s).

But does a barrier between writers and their readers really exist? Should writers simply give up on audience consideration because it is too difficult or nearly impossible? Should all considerations of audience be abandoned because the writer can never really know the "right" audience? Is the audience or the writer in charge of the ideas?

Audience Involved

There is a problem with abandoning audience, addressing it, invoking it, and making it a fiction. In all of these discussions of audience, the writer is still portrayed as the one inventing the message, and the audience is still portrayed as a passive receptor. Lunsford and Ede certainly hint at involving the reader to a greater extent in their piece on addressed and invoked audiences. "[A] weakness of research based on the concept of audience as invoked is that it distorts the processes of writing and reading by overemphasizing the power of the writer and undervaluing that of the reader" (Lunsford & Ede 165).

While rhetoricians like Lunsford and Ede admit that imagining an audience leaves the writer in complete power, they do not discuss how readers and writers might work together. Lunsford and Ede state that "a fully elaborated view of audience, then, must balance the creativity of the writer with the different, but equally important, creativity of the reader" (169). But how is this realized? If the audience is a combination of addressed and invoked, what type of audience is it?

Robert Johnson of Miami University terms this type of audience "involved." Involving the audience in the writing process turns an invoked audience into one that actually contributes to the content of a document directly. When the audience is involved, reader-writer collaboration is promoted. Johnson first states that to involve an audience, writers must begin by abandoning the traditional view of the solitary activity of writing. In "Audience Involved: Toward a Participatory Model of Writing", he describes writing as having "been viewed historically as an individual activity where the writer or rhetor creates a text of his or her own invention. The writer in this view is someone who, in isolation, collects information, organizes it into a coherent pattern, and then produces a finished text" (Johnson 362). As a direct result of this view of writing, says Johnson, the concrete audience of a document is left out of the picture during the writing process.

> Missing from most discussions of collaborative writing is *audience* as an actual living, breathing figure in the discourse production. By this I do not mean that community models ignore audiences conceptually; rather, I mean that real audiences are left out of our considerations of the discourse production process. (367)

A concept is not a living, breathing person, and thus cannot influence the content of a document on its own. The concept must be born from a real audience, and thus it is really that audience that potentially influences writing. Johnson and other rhetoricians suggest that a real end-user of a technology or "end-reader" of a document can help to shape documentation.

The key difference between the invoked or addressed audience and the involved audience is that the latter actively participates in the creation of knowledge, and indeed the content of a document. It is this creation of knowledge that Johnson stresses as one of the main advantages to involving an audience in the production of documentation (363). He points out that involving the audience in the composition process can also lead to other benefits, such as the end-user's effect on the design or dissemination of a product. "A disempowered user has little possibility of

influencing technology design or dissemination," (365) but writers can play the role of "advocates" for the users, who can give the writers ideas on changing technology, which writers can then pass on to engineers (370).

Over the years, rhetoricians have assigned many roles to readers, such as the ones highlighted by Mary Coney in "Technical Readers and Their Rhetorical Roles." Reader as receiver of information, reader as user, reader as decoder, and reader as professional colleague are a few roles readers have been called on to play (Coney 59-61). Perhaps allowing a reader to play the role of a writer in collaboration with an actual writer was too radical for rhetoricians to accept. However, recently rhetoricians and writers alike have found that the role of reader as writer can be realized both in theory and in practice.

Coney points out that a reader may take on the role of "maker of meaning" (61). In this situation, a document only takes on meaning or even matters at all when a reader engages it. "The resulting experience, while less efficient or predictable, frees the writer as well as the reader to form new alliances, to reshape communal knowledge and professional practice" (61). The idea of communal knowledge is a concept that has come a long way since the days of Aristotle and even the relatively recent days of Perelman and Olbrechts-Tyteca. In the model Coney and Johnson propose, for the first time readers are empowered to make key decisions affecting the outcome of the text they will read.

There are two key differences between an involved audience and the views of an addressed or invoked audience. First of all, knowledge is no longer disseminated to a reader with no feedback from that reader. Knowledge is shared between the writer and his audience during the writing process. Both the reader and the technical writer can add to or take away from the knowledge

base, which will in turn become the document itself. This constant updating of the content of a written work will make it truly reader-oriented. Readers can provide crucial elements they desire while writers can add to those elements and create ways to integrate them into the piece.

The second difference is the shift in the timeline of the writer's composition process. In a model where the audience is involved, the reader sees the document earlier in the writing process. Whereas traditionally the reader only sees a document in its finished form, an involved reader actually works with the writer to perfect the piece. In a true collaborative reader-writer model, the reader would interact with the document and the information used to write it even before the final draft is compiled. One such real-world opportunity for readers to become involved is through usability studies.

Toward a Humanist Approach to Usability Evaluation

Usability testing of a document (sometimes referred to as readability testing) has become extremely prevalent in the field of technical communication. During a usability test, potential users of a document are asked to read a document, perform a procedure, and let the writer know whether the document sufficiently aided them in operating the product it describes.

Usability, as defined in this paper, is the ability for users to accomplish tasks with the help of the documentation in question. Although this is a simplified definition of a much more complex practice, it highlights the key concept all evaluators should heed—the importance of directly analyzing the user, not just the document. Usability evaluations should certainly involve document analysis, but such analyses should be neither the only nor the main types of tests conducted.

Huatong Sun identifies two categories of approaches to usability studies: the engineering approach and the humanist approach (Sun 319). The main difference between the two approaches is the extent to which each considers a user's cultural or social contexts and the degree of feedback involved in the ongoing design process. The engineering approach is more document-centered while the humanist focuses particularly on a user's relationship to technology.

While it is true that usability evaluators sometimes work directly with users to determine the quality of a document, many tests are not necessarily targeted to analyze users. Instead, these usability studies are designed to systematically determine whether each part of the document works, often overlooking the potential of a user to truly alter the text or even the technology itself. The questions writers ask users during the studies, for instance, may be associated not with a user's particular background, but with the text itself. Huatong Sun believes that some user testing lacks consideration of social and cultural aspects. In other words, Sun is concerned that evaluators do not look at the overall context in which users use technology *and* read documentation, but only see a smaller picture.

Engineering Approach to Usability

The engineering approach to usability evaluation is a very mechanical way to conduct user studies, with clearly established guidelines and quantifiable information. In fact, Sun defines five metrics rhetoricians usually use when describing usability. The five metrics are: learnability, efficiency, memorability, errors, and satisfaction. Learnability measures how easily the user can learn how to use a document. Efficiency is the measure of how efficient the document is in assisting users with tasks. Memorability is a figure that represents how easy it is to remember certain procedures. Finally, satisfaction determines how subjectively pleasing the document is to

the user (320). Figure 1 (below) presents Jacob Nielsen's model of the classic engineering approach to usability (reproduced in Sun's article).

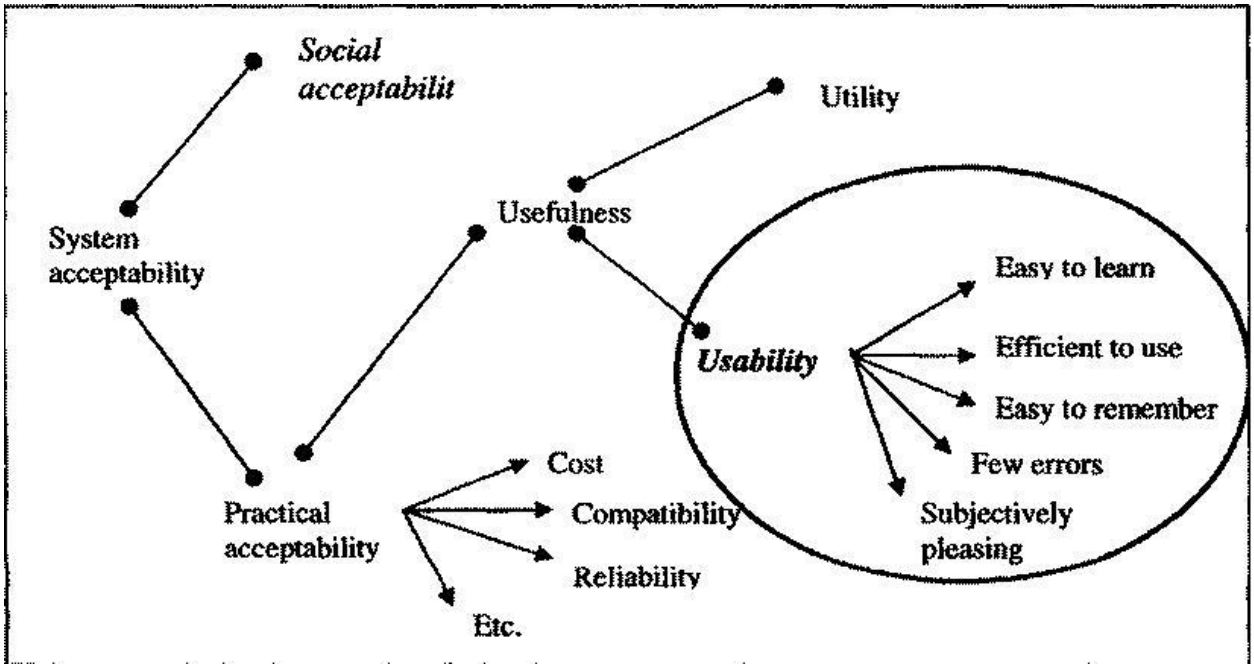

Figure 1: Usability as a Product Quality (Sun 320)

Sun sees many problems with the engineering approach, especially when applying it to real-world usability evaluations. The heuristics rhetoricians like Nielsen suggest are extremely systematic and methodical. "[The engineering approach] favors the [Nielsen] system and defines usability as attributes measured by quantitative methods" (Sun 320). Some examples of quantifiable factors are the number of errors a user makes or the amount of time it takes to learn how to perform a specific task. The problem with quantifying results is that it may be difficult to express user reactions and overall attitudes accurately as numbers. This type of mechanical approach to usability evaluation eventually leads to turning users into numbers as well, better known as test subjects (321).

Usability as discussed by Nielsen in the figure above is defined too narrowly. The heuristics outside of the circle surrounding the usability metrics (social acceptability, system acceptability, etc.) are not strongly related to usability in this model, but are instead considered separately when judging product quality. Researchers who argue for the humanist approach criticize the limited scope of the engineering approach, suggesting a much wider area of consideration in usability.

Humanist Approach: Creating a Collaborative Reader-Writer Model

The humanist approach is a user-oriented method of analyzing the efficiency of a document and a method for involving the readers in the shaping of the technology and its documentation. In defining the humanist approach, Sun actually begins by describing the types of things humanists try to avoid in constructing usability studies, which greatly reflect the engineering approach.

> Users are treated as test subjects from a mechanical view; only low-level actions are attended; usability is not introduced to the design process until the last stage; usability studies are reduced to usability testing and only the decontextualized uses of technology are studied. (321)

The solution most humanists suggest is a shift from measuring the quantifiable metrics of a document to including qualitative measures as well, such as the context and culture surrounding the user. Sun suggests that the terminology to use is “usability research”, implying a larger study encompassing both document quality and the culture of users (321).

The particular solution Sun proposes, building upon Johnson’s theories, involves “studying the interactions between users, social contexts, cultures and the design process” (321). While social and cultural considerations are important, it is the shift in roles of users that is perhaps the most vital to applying the humanist approach to usability. Evaluators, technical writers, and engineers

alike must realize that users are not limited to using information, but may also act as producers of information. They are "involved in the design process…as citizens who can serve as active participants in the larger technological order and who are equally responsible members of the technology enterprises of our culture" (321).

The humanist approach requires that users develop the closest possible relationship with writers or evaluators. Sun thus suggests, quite intuitively, that evaluators must engage the users directly. She terms this type of collaboration a "dialogic relationship" (321). A dialogic relationship leads to a stronger collaborative reader-writer model by allowing the user to affect more directly the outcome of a technical document, and thus come closer to playing the role of a writer.

A Summary of Theoretical Audience Models

The following three figures illustrate the theoretical roles of models in technical communication. Each model involves the user more than the next, and indeed shows how user involvement in the creation of documentation content has grown over the years.

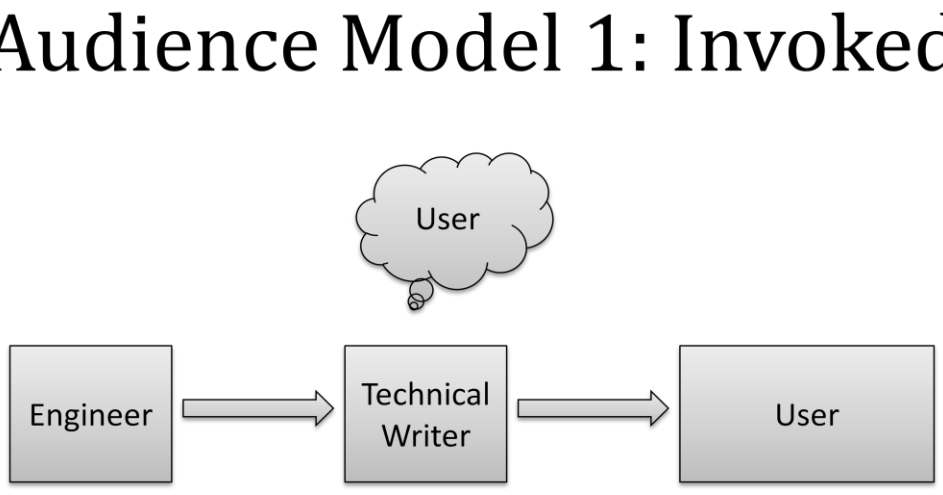

Figure 2: Audience Invoked – The user is not involved in the creation of manual content. The technical writer imagines the potential user based on past users of such documentation or typical users.

Audience Model 2: Addressed

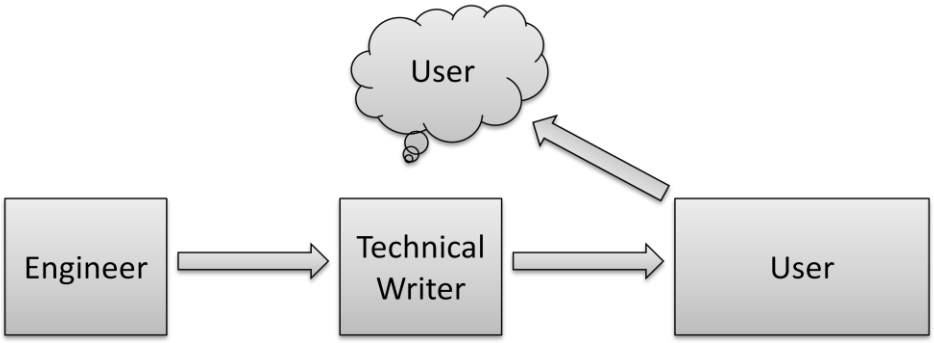

Figure 3: Audience Addressed – User is involved in the creation of an imagined audience in the writer's mind. Users contribute passively through questionnaires about their characteristics.

Audience Model 3: Involved

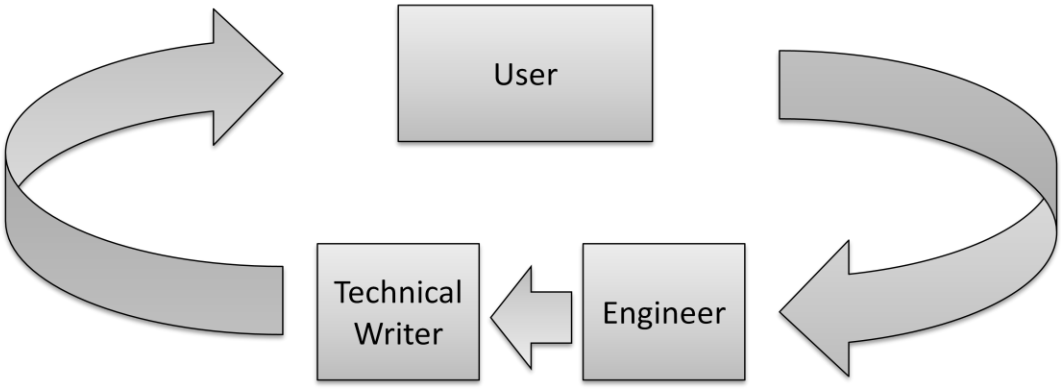

Figure 4: Audience Involved – Users are involved actively through usability studies and task analyses in the creation of content for technical manuals.

Audience in Technical Writing Textbooks

Textbooks have the potential to more directly affect the practices by technical writers today than do theoretical works. I examined two technical writing textbooks to determine how technical writers might be trained to approach the topic of audience. Although I can only do a limited analysis and although these two texts do not represent all ways that instructors teach aspiring writers about audience, they are influential. The writers I chose to focus on are Rebecca Burnett and John Lannon, both reliable sources in the professional and technical communication field.

Rebecca Burnett is professor of professional and technical writing at Iowa State University, both at the undergraduate and graduate levels. Burnett has written five textbooks on college and professional writing. One of her most recent books, *Technical Communication*, first published in 1986, is now in its sixth edition, published in 2005, the latter of which is the focus of my analysis. This book was published by Wadsworth Publishing, a brand of Cengage Learning. Cengage publishes textbooks, instructor supplements, test preparation materials and career assessment tools in over 35 countries. In addition, the company creates online reference databases, such as Gale, distance learning courses, and corporate training courses.

John Lannon has written countless books on the writing process and technical communication. As in the case of Burnett's books, some of these books have gone through several editions. Numerous editions usually indicate that the books are used extensively to instruct future technical writers.

John Lannon's technical writing textbook, appropriately entitled *Technical Writing*, was published in 1997 by Longman Publishing. In the following section, I am using the eleventh edition of that book, published in 2008. Longman was initially founded in London in 1724, and is now an imprint of Pearson Education. Today the publisher, better known as Pearson Longman, particularly specializes in English and English as a second language books, but also publishes history, economics, philosophy, political science, and religion literature (Wikipedia).

Lannon's *Technical Writing*

In his textbook, John Lannon points out first and foremost that technical communication is user-centered. Most of what the technical writer does, with the possible exception of certain standard design decisions, is done to meet the informational and organizational needs of his or her audience. Users do not have all of the power to determine the outcome of a technical document, but they certainly come first when determining the structure and content. "While a user-centered document never makes the writer 'disappear', it does focus on what the audience considers important" (Lannon 2).

Since audience comes first, it is necessary to know that audience before preparing an effective technical document. According to Lannon, the writer must know what the intended audience expects, assess the audience's information needs, identify levels of technicality, and use these to create an audience profile. He describes the various aspects of the reader, which a technical writer should consider. Lannon describes three particular reader characteristics each writer should consider before writing a document: reader's technical background, reader's cultural background, and reader's knowledge of the subject (28-35). By using these three characteristics, technical writers can create the audience profile with which to work.

Considering Reader's Technical Background

All readers have various levels of expertise in particular technical fields. For example, Lannon mentions some possible audience roles, such as engineers, managers, executives, and "the public", each of which may possess a different amount of professional experience. Each audience has different concerns, interests, and information needs (26). According to Lannon, the lower the level of expertise, the fewer technicalities should be contained within a document. He categorizes the technicality of documents into three distinct levels: highly technical, semi-technical, and nontechnical (28).

Highly technical documents target an audience composed of specialists in a particular field. The main informational needs of these experts are bare bone facts and figures, which they can interpret using their knowledge and experience. Such documents usually contain many abbreviations and acronyms, technical vocabulary, and graphs or tables (29).

Semi-technical documents target an audience with some technical background but less than experts. A second-year WPI student may be considered semi-technical but not quite as technical as a third or fourth-year student. In these cases, writers must identify the lowest level of technical comprehension and write to that level (30). Semi-technical documents usually include less technical vocabulary or more in-depth explanations of terminology. No abbreviations or acronyms are used and all graphs and tables are clearly explained.

Nontechnical documents are usually aimed at laypersons—people with no prior training in the field discussed in the documents. For these documents, in addition to excluding technical vocabulary, writers should omit detailed explanations and simplify all terminology. The rule of thumb is that nontechnical readers expect to understand the document after reading it once.

Considering Reader's Cultural Background and Environment

In some cases, every member of an audience may come from a different place and cultural heritage. Lannon points out that in some cultures, such as Germany, readers may prefer a document that is a bit more technical in nature but more thorough than one that is simplified. In American culture on the other hand, simplicity is valued greatly. "Anglo-American business culture generally values plain talk that gets right to the point" (36). Other cultures, such as the Chinese, prefer less direct documents in which the meaning is only suggested but ultimately left up to interpretation by the reader (36).

The type of societal role the audience plays may also contribute to the cultural background of an audience. Engineers, executives, managers, and the public have different levels of technical background, and that means they have worked in different educational and professional environments in their lives. These environments have shaped who they are not only as professionals but as human beings, and each will have different expectations (27).

Considering Reader's Knowledge of the Subject

By taking into account a reader's current knowledge about the subject described in a manual, the writer can avoid wasting the reader's time through redundancy. The knowledge discussed in the manual could be new and useful for the audience. On the other hand, the text might address something the audience already knows but often overlooks. Also, the writer may wish to give a new perspective on a topic familiar to readers (35). If readers see that the manual contains too much useless information, they may not read it as thoroughly and take it as seriously as they should.

Readers are Human, Too

The professional field of technical writing has come a long way since its beginnings in the mid-twentieth century. Technical communication today may be becoming more humanistic, where readers and users are not merely test subjects of a product but rather actual human beings with needs. Indeed many technical writing textbooks today put emphasis on considering the audience during the writing process. Furthermore, as seen above, current textbook authors suggest that the audience should become passively involved in composing a text before it is completed by responding to questionnaires and surveys about their background and expectations.

In his book, Lannon gives very specific instructions on constructing a reader profile. In a worksheet Lannon devised, he included three main sections: audience identity and needs, audience's probable attitude and personality, and audience expectations about the document (35). A writer should be concerned with every little detail about his readers and engage them before even starting the document.

According to Lannon, it is first important to know who the primary and secondary readers are. The primary reader is the one who requested the document and for whom the writer composes the document. The secondary reader will support the primary reader in a project and may refer to the document for guidance. Lannon reminds technical writers that the primary and secondary readers come from different backgrounds and require different levels of technicality (Lannon 31).

Secondly, Lannon suggests each writer should evaluate the audience's potential attitudes in reaction to the document, and in particular to the topic. Taking into account any possible

objections and the temperament of readers may allow the writer to address any problems before they arise.

Usability Testing and User Feedback

After a writer finishes the document, Lannon suggests the writer must test it on the intended audience and revise it by incorporating user feedback. If usability testing is not a possibility, as this may be the case in some companies, the writer should indicate to the users the type of feedback he or she desires. Specifically, the writer should direct the user to take note of the following: any discrepancies in the content, either omissions or inaccuracies, organizational issues, stylistic problems, such as sentences that are too complex, design problems like confusing headings or unclear visuals, and legal mistakes like safety information (42). If usability testing is an option, however, Lannon gives some guidelines on conducting such tests.

According to Lannon, the purpose of any usability test is to determine whether the users can "easily locate the information they need, understand the information immediately, [and] use the information successfully" (512). There are two types of usability tests: alpha tests and beta tests. Alpha testing involves product designers and document authors going through the document and working with the product to determine the usability of the document according to the three metrics contained in its definition. During beta testing, actual users test the document by reading it and completing tasks assigned by the writer. This type of testing is also broken down into two categories: qualitative testing and quantitative testing.

Essentially, qualitative testing helps a writer to determine which parts of the document work and which ones do not. Lannon suggests two possible ways of conducting qualitative usability testing. A writer may use focus groups, which entails a series of meetings with the writer to discuss their feelings about the document and to point out any difficulties they encountered.

During these meetings, users involve themselves directly by suggesting revisions to the document.

Alternatively, a writer may choose to conduct a protocol analysis, otherwise known as a think-aloud protocol. The protocol analysis may be a one-on-one interview in which the writer assigns a section for the user to examine and then relay his or her feelings about it. On the other hand, the writer may wish to leave the user alone and observe from a distance while he or she completes a task with the aid of the manual.

A quantitative test is another usability test, which involves creating different versions of the same document and administering each to users. A control group is usually created in a quantitative test to have something with which to compare each document version. The writer then counts the number of people who accurately accomplished an assigned task using each document version.

Lannon's textbook closely resembles the model of "audience involved" as discussed by Johnson and Sun. The audience in this case is involved both before the writer composes the document and after the first draft is complete. In the beginning, the audience is somewhat "addressed" because the writer may not interact with the intended user outside of questionnaires, but that user is still influencing the content and structure of the manual before it is even written. Once the rough draft is complete, the audience becomes actively involved by making suggestions which will ultimately change the outcome of the final draft.

Burnett's *Technical Communication*

Rebecca Burnett begins by defining the two main purposes of the technical writer: "to concisely and accurately convey verifiable information and to persuade audiences to attend to this information" (Burnett 112). To address the first purpose, a writer might consider the type of

information the intended audience needs, the types of decisions that audience needs to make, and the questions the audience will need answered. To fulfill his second obligation, the writer might ask him or herself about the types of actions the document should influence, what constraints on persuasiveness exist, and the types of objections the audience may have (112).

Burnett's Audience Analysis

In her textbook, Burnett gives a detailed, step-by-step process for technical writers to follow when writing a document. The first step is to identify the intended audience; Burnett gives four different audience types as possibilities. These audience partitions build on Lannon's primary and secondary readers by expanding the definitions to potentially fit the types of audience models in actual workplaces.

The initial audience is the party to whom the writer submits the document, but is not necessarily the main user; a manager at a company that contracts a technical writer is one example. The manager may be but is not always the primary audience, which is the party that uses the document and is the intended audience. The secondary audience also reads and is directly affected by the document or any decisions made based on it. Finally, the external audience is usually outside of the organization where the initial audience is located but is still affected, like the secondary audience, by the decisions made based on the document (114).

The second step in this logical progression is to conduct an in-depth audience analysis, similar to Lannon's suggestion. In order to conduct such an assessment, the writer may talk directly to the users or speak with people within his or her company who deal with these users. Some people within the company to talk with include design and development personnel, the marketing department, sales, and customer service. Design and development can give insight into the type of background the user needs. Marketing works directly with customers to identify their needs

and find ways to meet them. Sales can relay to writers how customers have reacted to similar manuals in the past. Customer service can tell writers what causes most difficulties for users in similar manuals (116-117).

The first step in audience analysis is to determine the type of audience for which the writer intends to compose. The audience's familiarity with the subject the writer is describing, audience expectations, and any prior knowledge define the type of audience. Some types Burnett mentions include experts, professional non-experts, technicians, students, and children. The familiarity with the subject may include any theories, concepts or generalizations the users may already know. Audience expectations are basically user wants and informational needs. Prior knowledge refers to the types of degrees, training, or experience in the field within the scope of the document (115).

In addition, the writer needs to consider the context within which users will read the document, the purposes of those users, their reading levels, and organizational roles. A technician in a loud, often messy environment may need hard binding, pages that lie flat, a clear table of contents, and potentially a lower reading level than someone in a managerial position. The manager with a graduate degree may require more detailed explanations at a more technical reading level but his or her time may be more limited than the technicians. Therefore, the writer must also include, as a part of context analysis, the amount of time the audience has to read the document. If time is limited, abstracts or summaries, headings and subheadings, definitions of terms, and a non-crowded page layout may be necessary (119).

Audience Receptivity

Burnett points out obstacles writers may encounter when writing for a specific audience. One of these is known as audience receptivity, the audience's willingness to accept the information in

the document at face value. If the audience's purpose is known, then the writer can increase audience receptivity by including information more likely to persuade that audience. The general rules Burnett suggests for receptive audiences is to present recommendations, then support them later. For resistant audiences, writers should present the problem, discuss alternatives, and only then present the solution and convince the audience that it is the best one (120).

Another problem Burnett describes in relation to audience receptivity is limited literacy. People with limited literacy have trouble interpreting information from written documents. These people are usually intimidated or confused by bulky, text-heavy manuals. They may not be able to use a table of contents or headings to preview what is to come, treat boxes with bold text as more important than plain text, and understand all of the content even if they read the entire manual (124).

In some cases, limited literacy is life threatening, such as in patients who take medication incorrectly because they have misread or failed to read the instructions. For individuals with limited literacy, writers or their companies may wish to consider alternate forms of presenting the same information. Using training programs, DVDs, or multimedia programs may help to relay the information to these people more efficiently. The most important thing is to choose a medium that is usable and accessible and relay the necessary information

Usability Testing

Burnett gives an in-depth analysis of usability and usability studies in the field of technical communication. She defines usability as "the degree to which texts, regardless of their materiality or mode, effectively and easily enable people to accomplish their goals" (308). The writer's goal should be to place user concerns above text features and all else when designing and developing a document (306). As Lannon also mentions, there are five main principles of

usability that can be applied to technical documents as well as the technologies they describe: learnability, efficiency, memorability, error recovery, and satisfaction. Burnett defines these a bit differently in relation to users.

Learnability measures how quickly users can become productive while reading a document. Efficiency measures how productive users are once they are using the text to accomplish the desired tasks. Memorability determines how well people can reuse the text to accomplish those same tasks or apply their knowledge of the document structure to accomplish new ones. Error recovery refers to the number of errors people make while using a document, the severity of these errors and the amount of time they need to correct them. Satisfaction is the overall feeling of users about the document, including the likeliness that users will pick it up again and any reasons for their pleasurable or disagreeable experience (308).

Burnett defines usability testing as "a structured process that gathers information about specific use from people similar to the intended users" (310). The main purposes of a usability test are to allow the writer to measure learnability, efficiency, memorability, error recovery, and user satisfaction as well as to identify problems with the rough draft of a text before the finalized version is released. Also, usability tests can provide results which are applied to future documents to improve their usability (310).

Before designing a usability test, a writer should consider several factors. First, the writer must determine the types of behavior or responses he or she is looking for in users. The four main factors writers need to look for are cognition, perception, affect, and performance and behavior. Cognition refers to the users thinking about the text. Perception is the level of user comprehension of the document. Affect is the user attitude toward the text. Performance and behavior define what users actually do with the text (311).

Writers should also take into account the limitations on usability tests. Choosing the correct participants for a test is essential, since the test participants need to reflect as closely as possible the actual potential users. It is certainly best, though not always possible, to allow those actual users to test the document. Along the same lines, the test situation, such as the tasks assigned must resemble situations users will actually encounter in the workplace. Establishing a well-defined test procedure before conducting a usability test is also important because the information obtained will be more useful. Additionally, various test techniques must be employed because user-testing alone is usually not enough to determine the usability of a document (312).

In order to design a usability test, writers must also know the types of tests that are at their disposal. Burnett talks about three types of tests: text-based, expert-based, and user-based. Text-based testing is usually conducted by writers themselves, and involves proofreading the text for local language issues and design problems. While this type of testing is useful for checking overall readability, it does not indicate how users will respond to a text (315). Expert-based testing is conducted to verify that the document is technically accurate, complete, coherent, and consistent. Subject-matter experts and engineers are the ones who conduct these tests most often, since they are the ones who can determine the accuracy of the information. Unfortunately, for the same reason these tests also lack the ability to predict user responses because experts already know and understand all of the information. Fortunately, to compensate for text-based and expert-based tests that exclude users, user-based testing parses information directly from users (315-317). Since it addresses the audience of a document, I focus here most closely on user-based testing.

There are two types of user-based testing called concurrent testing and retrospective testing. During a concurrent test, writers may ask users to read a document and perform a task while the

writer observes their behavior, such as the amount of time taken to locate information or complete the task. In other cases, writers ask users to verbalize their thoughts while reading the document; such sessions are often tape-recorded for future review. A retrospective test involves the use of questionnaires and interviews to ask users what they thought about a document after they read it (320). One problem with retrospective testing, however, is that participants may fabricate answers because they think the writers wish to hear a specific answer. In addition, a participant may simply forget some parts of the test and answer incorrectly as a result.

After the writer has considered the options available, he or she may begin to design the usability plan. First, the writer must establish the goal of the usability test, which includes the information that needs to be gathered. Next, an assessment of the importance of the text is conducted to determine the types of tests to conduct. Although not true for all written documents, technical manuals usually require text-based, expert-based, and user-based testing. Any constraints need to be identified as well, like the availability of test participants, time, and money. It is very important to decide at which time during the development cycle the usability tests will be implemented. Finally, the writer must determine beforehand how the test results will be used to update the documentation. When the writer is ready to design the specific usability test, Burnett suggests the following series of actions, which vary on a case-by-case basis:

1. Analyze the intended users and their on-the-job tasks
2. Locate test participants
3. Develop test strategies
4. Identify the test location and materials
5. Explain the test to participants

6. Conduct the test
7. Record and report test results to the rest of the design team to improve document and product design (323)

Determining the characteristics of intended users is something each writer must do in order to choose the best test participants. Therefore, a detailed user analysis is needed, as shown in Figure 4, to create a user profile. The user profile is especially important when the test participants are not necessarily the intended users themselves. In addition, a task analysis is an invaluable tool for technical writers because it allows them to understand what the users are trying to accomplish with a product and tailor the document accordingly. Writers can either interview or observe the users while they work with the product or make a list of the tasks they may potentially engage in. Some aspects of tasks writers can focus on include the steps taken to accomplish each task, the available resources, any constraints, the context within which the tasks are performed, and problems and frustrations while completing tasks (324).

Once the user and task analyses are complete, writers need to find test participants and schedule a time for them to come in. The test participants should reflect those determined in the user analyses. Burnett suggests no more than five to eight participants will suffice, but they must have various levels of experience with the type of document the writer is developing (325). Next, the writer can develop the scenario and possibly a list of questions, depending on the usability test. An optional pilot can be tested on people other than the participants, such as others in the writer's department, to make any final tweaks. The writers will want to then find an appropriate location for testing, lay out all of the materials, and ensure everything is in working order. Finally, writers must explain to each participant the gist of the usability test, possibly using an introductory script describing the purposes and procedures (325).

The writer may then conduct the test, preferably recording the procedure with a tape recorder or video camera. Recording the test, especially as a video, allows the writer to review participant responses and behavior. Burnett also suggests some techniques the writer can use during the test. Writers should avoid asking leading questions in order to avoid receiving unwanted responses. They should also encourage participants to move on to the next task if they become too confused or frustrated. If many participants encounter the same problem multiple times, writers should note it and eliminate the task causing it because it no longer needs to be tested. Writers need to also pay as much attention to any facial expressions and body language exhibited by participants as to their verbal comments.

After the tests are complete, the writer needs to organize the results and interpret them in order to adequately modify the draft of the document. Although not all results can be quantified, the time participants took to complete tasks, the number of errors during each task, and the number of participants sharing similar usability issues should all be considered.

Audience in Practice: The Technical Writer's Approach

Rhetoricians like Johnson and Sun point out that involving the audience in the composition process is vital to putting together efficient documentation. While the involved audience certainly seems like a good idea, it is necessary to put it to the test in practice. Do actual technical writers use Johnson's theory of involving the audience? If not, which other theories may they use from the ones presented here? Do they have a hybrid of their own as presented in Lannon's textbook—a combination of addressed and involved audience models?

Interviewing Technical Writers

For the purposes of this research paper, I could only interview three technical writers in a limited number of fields. It is possible, and quite probable, that technical writers in fields other than the ones I considered work differently. This is not surprising, as I soon found out after interviewing writers, because there may exist several approaches to the writing process technical writers employ even while at a single company. Examining just a few below will still help to understand some of the ways in which technical writers in some specific contexts compose technical documents and how they treat audience.

I used the following template questions during my interviews:

What degree(s) do you hold?

Which college(s) did you attend?

Tell me a little about your company. How old is it? What do you manufacture, etc.?

How many technical writers does your company employ?

Describe your current project (describe the steps you took or are taking to accomplish the goal):

Who is the audience / readers of this current project?

What are some of the needs of this audience and how do you address them?

At which point in the writing process do you begin to include the intended audience? Elaborate (beginning, during, after product is finished). Why during this stage(s)?

I realize all companies have various technical writing approaches. How do you work with readers when composing such a document? Do you interact with them directly? Do you analyze them without ever seeing them? Why this approach?

Is there a certain set of guidelines you must follow when compiling documentation?

Do you have any experience with usability / readability testing?

In regards to usability studies, do you (or another evaluator) ever get comments which necessitate a change not only in the documentation but also in the technology itself?

Technical Writers at Raytheon

On February 12, 2009, I interviewed Jason Hall, a senior technical writer and editor at Raytheon in Marlborough, Mass. On February 18, I subsequently interviewed Matthew Andersen, an entry level technical writer at Raytheon. Both provided me with insights about the practices of a technical writer in an advanced engineering corporation.

Raytheon is a national defense contractor that develops integrated defense systems, intelligence and information systems, missile systems, and space and airborne systems. First established in 1922, Raytheon has been a global leader in technological advances. In 1942, Raytheon developed the first naval microwave radar, undetectable by enemy German submarines. In addition, Raytheon became the first company in 1948 to develop a missile guidance system that could hit a flying target (Raytheon.com).

Raytheon Technical Services Corporation, the division which employs Jason, currently employs 25 technical writers in three locations. These include Sudbury and Marlboro, Massachusetts, and Portsmouth, Rhode Island. Raytheon is currently working on developing a new destroyer for the Navy, and Jason and Matthew are aiding in the creation of the documentation which will be shipped with that boat.

Technical Writers are Interdisciplinary

Before delving into the specifics of their writing process, I found it necessary to find out their educational and professional background because knowing this would indicate the types of qualifications employers like Raytheon search for in a person when hiring a technical writer. The type and quantity of knowledge and experience could certainly affect a writer's performance in the field. The drastic difference in the backgrounds of these two writers showed that technical writers come from a variety of academic disciplines.

A former Navy sailor himself, Jason spent four years with the Navy, working with equipment not unlike the boat currently being manufactured. This also meant that he read the manuals possibly similar to those he is currently writing. This type of transition from a reader to a writer helped Jason to better know what audiences—in this instance, sailors—require in a manual, having experienced it first hand in the Navy.

Matthew on the other hand holds a degree in Professional and Technical Writing from Utah State University. His training included courses in linguistics and rhetorical theory; in the latter he studied how corporations use rhetoric. He was also required to take courses specifically in technical communication, where he learned about document design, received training in software like FrameMaker and Photoshop, and created a portfolio of technical documents as a capstone project.

Although Matthew and Jason came to Raytheon with different sets of skills, each brought something to the table. This shows that technical communication is an extremely interdisciplinary profession. While Jason was a user who turned into a writer, Matthew was unfamiliar with the topic but familiar with techniques used to quickly familiarize himself with the subject matter. "We were taught to work with subject matter experts and learn about the field that we were writing about….We were taught to learn things on our own…We were taught to use our brains," said Matthew.

The Technical Writer's Process at Raytheon

Jason described the general process he must go through when writing a technical manual, giving specific examples of each action he must take. First, he needs to figure out who will be the audience of the document. Next, he considers the customer needs and expectations; the customer and the audience are not one and the same. For instance, the customer is the government while

the audience is the sailors. Most of the information about customers and intended audience is usually outlined in the final contract Raytheon's customer provides when placing their order.

After the government submits an initial contract to Raytheon, all parties involved in the project, including the engineers and technical writers, must submit a proposal of their own. The proposal then outlines the type of project that is realistic for the budget and time constraints outlined in the contract. The final contract is then negotiated with the government based on this proposal, and it is this document that Jason uses when gathering information for his technical manual.

The next part of the composition process involves reading existing engineering documents related to the product and compiling all of the data, a term technical writers use to refer to the information that makes up the content of a manual. To gather other data, "we must get in good with the engineers," said Jason, "they are going to make this stuff and we have to interpret their engineering memos," or white papers. By talking with engineers, Jason can also find out whether the data he has compiled so far on his own is accurate.

When Jason has assembled all of the necessary data, he writes what he refers to as the story. The story essentially describes how something works and how to fix it when it stops working. The manual tells the reader all of the logistics as well, such as the part numbers to order when something breaks. For this section of the manual, Jason needs to talk to the engineers known as the "logistics folks". Jason must keep several things in mind when writing the manual in order to meet the expectations of the readers as well as the customer.

"Engineers don't care about the end-customer," Jason said boldly. If given the chance to write one of these manuals, they could ramble on and on about their part of the product, using highly technical vocabulary and telling readers far more than they need to know. Instead, what Jason attempts to do is sift through what the engineers tell him, decide what is most important, and

write simply only that which is important to the reader. “We have to not dumb it down, but make it more end-user friendly,” Jason explained.

Since Jason assumes from his own experience in the Navy that most sailors are only high-school graduates, he addresses a universal audience to make sure those with some knowledge of similar technologies and those with none whatsoever are taken into account. “These are [usually] kids out of high school, and they don’t know all of the technical jargon, and they need to understand it right away,” added Matthew during his interview.

Technical writers at Raytheon need to write at the ninth-grade reading level, since many sailors enter the Navy right out of high school. Again, this is the type of information the government always gives to Raytheon when placing an order. These writers also usually assume the sailors possess some level of knowledge about the boat they are working with because they have been trained on the job by their supervisors. As a former sailor himself, he is familiar with this type of training because he has gone through it himself.

Since both Jason and Matthew write for the same kind of audience every time, namely sailors on the boat, he realizes their needs are to be able to quickly and efficiently use the equipment on the ship. Although some user needs are described in the government’s contract, end-users can also relay any additional needs they have to the writer during the review process, discussed in greater detail later.

As far as style is concerned, Matthew pointed out that technical writers at Raytheon utilize certain established guidelines when composing a document. The writer must adhere to certain fonts and font sizes. Also, the types of words used and the context within which they are used are essential. One of the reasons for the latter specification is for multilingual purposes; it is easier to translate some parts of speech or entire phrases into other languages without much effort. For

that same reason, the general sentence structure to use in documents is also specified to technical writers at Raytheon.

Once the first draft of the manual is complete, Jason sends it off to the engineers, who review it and make sure all of the technical details are correct. Safety reviewers, who make sure the writer has followed all safety precautions and standards, need to see it as well before it goes out to the customer. Finally, when all the necessary personnel have had a chance to review the document, Raytheon sends it to the customer—the government.

The customer has a chance to critique the preliminary version, also referred to as the "review draft copy", before the manual is released in its final form. Readers, or sailors and their supervisors, write down comments and send them back to Raytheon, whereupon the writers incorporate those comments into the document and go through the entire internal process of scientific review again. All review programs are different. Whereas some take a total of three weeks, others may take as long as 45 days.

The number of times the review draft copy goes back and forth between Raytheon and the customer depends on the amount of money the customer wishes to spend on the product. For instance, the Navy gives Raytheon a figure and the company then tells the Navy how many review cycles that amount buys them. Raytheon never actually brings in the readers, however, to work with them personally.

Instead, writers go out into the field for validation of procedures, to make sure each of them is described correctly. Each writer goes out to a ship and tests each procedure step-by-step without deviating from the text; in effect, the writer becomes the user. If a deviation is required to complete a task correctly, then the writer knows something is wrong with the document. Jason also indicated that even if the technology could be made more user-friendly in those instances, it

is always easier to document around it. There is the tradeoff of a more complicated manual for eliminating the need to redesign an entire system or even one component, the latter of which would probably lead to redesigning the entire system.

Once the final draft is released to the customer, the readers are still allowed to provide feedback to the writers via special reports located in the back of every manual. These reports are known as technical manual deficiency reports, and tell the writer to look at the manual again, either to correct a safety issue or another mistake. The issues these reports address may or may not be in the contract, but are important because any mistakes in the user manual could be life-threatening on a naval destroyer.

Models of Audience at Raytheon

The model which would most accurately describe roles of audience used by technical writers like Jason at Raytheon is "audience addressed". Since the writers do not interact with the readers until it comes time to test the review draft copy, during this time the audience's role is most likely "addressed." Using his past experiences as a sailor and what he knows from the contract he is given, Jason assumes the type of audience he is addressing without their direct involvement.

Given the potentially dangerous military context of Raytheon's work, it is extremely important to listen closely to every concern a user may have. Raytheon tries as much as possible to maintain a close relationship with readers through correspondence and feedback reports. It is this type of correspondence that makes the users a bit more involved by using a sort of retrospective testing, as described by Burnett.

When the users receive the review draft copy and comment on it, they become a lot more involved in the outcome of a manual. Nevertheless, this process is not considered a concurrent

usability test, and users may certainly make mistakes while using a document and neglect to report them. The technical manual deficiency reports as well as the initial feedback are tools that reflect Lannon's questionnaire, except that this feedback regards the document.

The use of a contract in Raytheon's case is something that takes away from the power of the audience. They are not the ones negotiating the contract with the engineers and writers. Instead, it is the government that draws up the contract, assuming that most sailors are at least high-school graduates. Because the audience is so removed, one could say that the audience in the early stages of document creation at Raytheon is a fiction. The writers do *think* about the audience, but do not actually interact with them at any point aside from bumping into them while testing procedures on the ship. Personal interaction takes time, and the contract usually only allows for so much of it.

The readers of Raytheon documents certainly contribute to the knowledge base of the writer, but it is important to realize that there is only so much reader involvement that is realistically feasible in the professional world. As another technical writer points out in the following section, there are a few companies that strive to consider and involve audiences as much as possible, but in the end only invoke or address them.

The following figure shows the general process Jason follows in composing a technical manual at Raytheon.

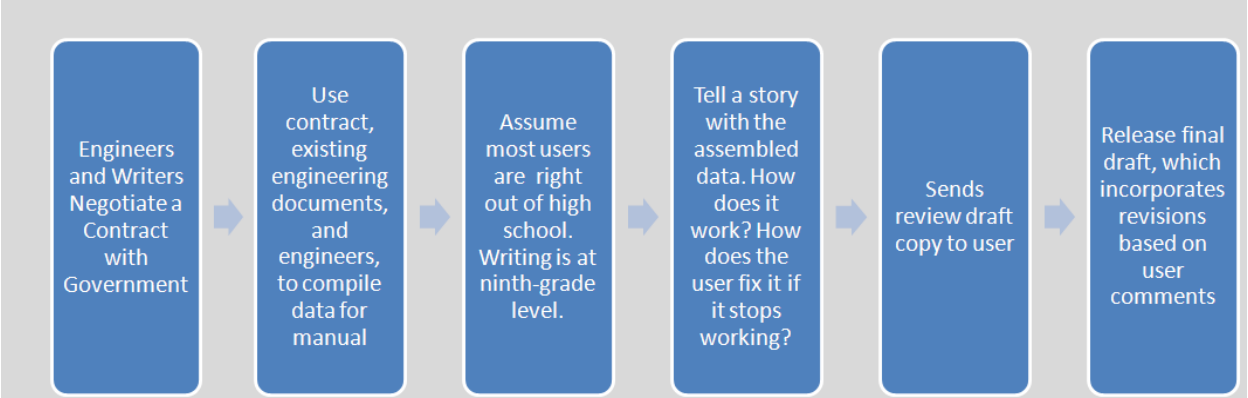

Figure 5: Jason Hall's Writing Process at Raytheon

Scott Runstrom at MathWorks

On March 2, 2009, I interviewed Scott Runstrom, a technical writer at MathWorks in Natick, Massachusetts. Interviewing Scott helped me to compare and contrast the various ways in which technical writers and companies in different fields approach technical communication. Also, it gave me another look at the ways in which technical writers in various technological fields consider their audience.

MathWorks is a private company, established in 1984, which specializes in creating technical computing software, primarily for automotive and aerospace clients. Their main two products are MATLAB and Simulink, a high-level language and interactive environment used for intensive computing and a multidomain simulation program, respectively. Programs like Simulink are regularly used in the automotive industry, for instance, to test the transmission in newly manufactured automobiles. In addition, MathWorks manufactures nearly 100 other products.

MathWorks currently employs approximately 2000 people, approximately 60 of whom are technical writers. Of course, this figure is not a constant; the more developers in the company, the more technical writers are needed, says Scott. MathWorks also tends to hire technical writers

who have at least some technical background, and indeed many writers currently employed there hold PhD's and other degrees in engineering fields.

Scott received his Bachelor's Degree in Technical, Scientific, and Professional Communication from WPI and his Master's Degree in Professional Communication from Clark University. His technical background while at WPI was in Aerospace Engineering, a major he pursued before switching to the latter, now known as Professional Writing.

Strict Technical Writing Process at MathWorks

In order to relay to me how technical writers compile documentation at MathWorks and the type of roles audiences play, Scott needed to do two things. First, he outlined the general process each writer must go through before, during, and after writing a technical manual. Then he applied this process to the current project on which his team is working to show me the process in action.

Scott described the overall procedure each writer must follow as the acronym RFAIN. The letters stand for the following: Requirements, Functional Design, Architectural Design, Implementation, and iNtegration. During the requirements stage, writers determine who the customers are, their particular needs, and the customer workflow, or the types of tasks they wish to accomplish while using the product. Coming up with the functional design of the document involves determining how to meet the needs of the customer. Architectural design refers to the potential structure of the actual document. Implementing is the act of actually writing the technical manual. Finally, integration is done more on the customer's side, because it is the process of assimilating the product into the rest of the customer's work environment. MathWorks, however, assists their customers with this process if they have any problems.

After giving me the background on the technical writer's procedure, Scott talked about his current project. Currently his team is developing a piece of software called PolySpace, which is a

program that mathematically finds bugs within the user's programming code. PolySpace also proves that these pieces of code are bugs using mathematical methods. Scott proceeded to show me how he systematically applies RFAIN to the PolySpace project.

In order to determine the requirements of the PolySpace project, Scott must talk with the MathWorks employees in the Marketing and Customer Support departments. These are the individuals whose sole purpose in the company is to interact with customers and determine their particular needs for each product. In the case of PolySpace, the primary users of the software are developers and Quality Assurance personnel.

The tasks these users need to accomplish and their particular needs go hand in hand. The developers need to write code every day and compile it at the end of every day. Thus, they need to run PolySpace immediately, right out of the box, at the end of every day, and they need it to run fast. QA needs to put all of the code together (i.e. transmission code, radio code, etc. in an automotive industry) and run PolySpace on it all to check for bugs. Since they are not developers, they do not need it every day, but they do need the bug report to clearly state the outcome of the bug test.

An interesting approach MathWorks employs in considering each individual customer is the creation of user profiles. Scott refers to these profiles as "personas of audiences", and they consist of an arbitrary name, the general educational background of a user group, their overall workflow, and even a clipart face. These personas are then referred to in meetings by their names in order to avoid any confusion as to which user group is being considered.

Based on these customer workflows (tasks) and needs, Scott and his team then come up with a functional design. The design of the document is task-oriented, specific down to the procedural levels, like opening a file and producing some code. Thus, the content of the document is

structured around those needs. For instance, Scott knows that developers and QA are the primary users of PolySpace, and for this reason he includes content that will allow them to quickly and efficiently complete their everyday tasks.

The architectural design goes hand in hand with the functional design, and refers to the organization of the actual manual. Scott pointed out that technical writers at MathWorks go so far as to anticipate what a user will wish to accomplish after he or she is done with a particular task. Also, if a user struggles with a procedure, a manual might offer guidance or another way to go about doing it. The writers know their users so well that they can anticipate their questions and suggest alternatives while writing the manuals on their own. After all of the analysis is complete, Scott and his team can write the documentation and send it off to the customer, who will then integrate the product with the rest of their system.

When a program is first released, MathWorks ships it with a manual, and the users have a chance to review it. They submit any comments or concerns to the customer service department at MathWorks. Sometimes these comments even necessitate a change in the product itself, but this type of change almost never happens. Similar to Jason Hall's comment on changes in technologies, Scott noted that in the type of industry where technical writing exists, writers will most often document their way around a fault in the technology rather than making it more user-friendly. Sometimes the resulting documentation is longer and more convoluted, but a documentation change is more cost-efficient and less of a hassle in general.

After the first release is created, some usability tests are conducted at the MathWorks facility in Natick. During such tests, technical writers come up with scenarios, which consist of series of tasks a user must complete while reading the corresponding piece of documentation. In a room with two-sided mirrors, the user attempts to complete these tasks while the writers observe his or

her actions. The user is encouraged to think out loud during the entire scenario so that the writers can better understand how the user applies the content of the manual to the product. Scott says that usability tests are not done very often because of the difficulty in scheduling to bring customers in.

MathWorks then releases a new manual every six months with a new version of PolySpace or any other product they are updating. The elaborate process known as RFAIN only occurs during the first release, and afterward only minor changes are made to the manual. The writers at MathWorks do not need to evaluate the workflow of a customer they already know, and thus can add the documentation for the new features using the same requirements, functional design, and architectural design.

Scott Runstrom on Technical Writers in General

Scott told me that it is very rare for technical writers to actually directly interact with their readers. He has worked at numerous other companies as a technical writer, including Computer Associates, Stratus Computer, Iconics, Waters, and Applied Biosystems, to name a few. In his experience, about a quarter of all technical writers never even consider the audience in great detail when writing. Instead, these writers think about what they know about the audience and write some very basic information, either meant for a novice or expert.

“It is very unusual [for writers] to talk to customers,” says Scott. It is much more common to talk to someone within the company who interacts directly with these customers as part of their job as technical writers do at MathWorks. It is also very unusual to do usability studies on a technical document; MathWorks is a unique exception to the general rule.

Models of Audience at MathWorks

The closest model that can be applied to the role of audience at MathWorks is "audience involved". Although technical writers at MathWorks do not directly interact with users during the writing process, they indirectly do so through other personnel at the company. Writers at this company take the time to analyze the specific workflow of each customer while Raytheon's writers look only at the contract they are given.

One tool both MathWorks and Raytheon use is writer feedback, an even more refined tool at Raytheon with the help of technical manual deficiency reports. However, the true difference between Raytheon's addressed and MathWorks's involved audience lies in usability testing. While these companies both employ usability tests, Raytheon uses retrospective tests and MathWorks uses concurrent testing with think-aloud protocols, always conducted once the rough draft of the document is complete. Retrospective tests are similar to providing simple user feedback; it is useful but is not always accurate and keeps the audience-writer relationship impersonal. Concurrent tests on the other hand allow writers to study user behavior more directly without the need to second-guess the user's answers to a questionnaire.

The difference in the practices of the two companies may exist partially due to the different contexts within which each is functioning and the types of target audiences. MathWorks targets engineers in a business setting who have deadlines and where time is precious. For this reason, MathWorks writers analyze their workflow to allow them to meet those deadlines in the most efficient way. Raytheon targets sailors in a military setting where time is also precious but the technology is much more delicate and where maintaining safety is key. Thus, unlike MathWorks writers, Raytheon sends their technical writers out onto the boat to check their writing against the actual product.

It is difficult to identify exactly which type of audience identified by rhetoricians in this paper is applied to writers at each of these companies, but the audience addressed and involved seem to fit best of all. According to Scott Runstrom, it is not very clear-cut in the industry, and most of the time a writer will end up addressing a universal audience—an expert or a novice one. Writers seem to use that method which is either required by the company, such as in the case of RFAIN, most helpful in the context, such as in Raytheon's case, or most cost-effective or convenient, as in the case of that portion of writers who never consider audience outside of a universal one. In other words, theory and practice do not necessarily coincide in the field of technical communication; instead, the roles of audience vary on a case-by-case basis.

The following figure outlines the RFAIN process Scott follows at MathWorks when composing technical manuals.

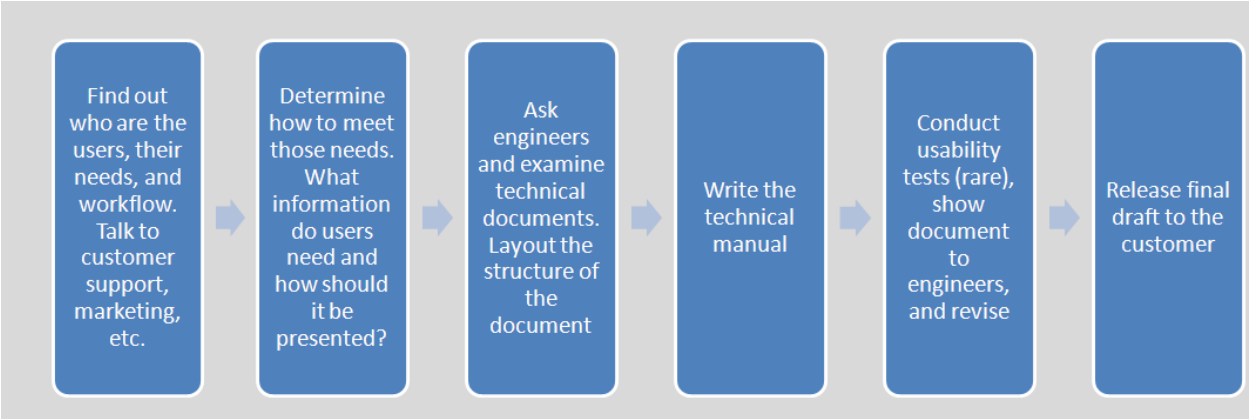

Figure 6: RFAIN Writing Process used at MathWorks

Models of Audience are Overly Simplistic

Rhetoricians, textbook writers, and practicing technical writers all have somewhat differing views about the roles audiences play in the writing process. Theorizing does not always involve considering that which is practical, and thus rhetoricians may find themselves analyzing general cases instead of specific ones like technical communication. In comparing theory to practice, I have found that there are at least six factors rhetoricians often miss when discussing the roles of audience in written communication: material constraints, cultural context, writer's background, division of labor, information design tools, and reader resistance. All of these factors may determine the role of the audience and the ways in which the audience and the tech writer interact.

Material Constraints

Taking into account the constraints of time and money is something rhetoricians and instructors must do to present a more realistic, albeit still theoretical audience model. Textbook writers aim to teach future technical writers, but tend to also prescribe that which makes the most sense in theory, not necessarily in practice. Similar to rhetoricians, they do not always give concrete examples of companies that use their theories or their efficiency in relation to time and cost. Perhaps the authors of scholarly articles, books, and textbooks are just suggesting some tools to choose from—a palette of sorts—for aspiring or current technical writers. It is ultimately up to the writers to choose which tools work best in which scenarios.

In the case of Raytheon, material and temporal constraints are extremely important, since there is a specific deadline and budget for each project clearly outlined in the negotiated contract. On the other hand, MathWorks does not have such contracts, and thus the time and money allotted are taken into account quite differently. In any case, conducting usability studies or deeply analyzing

audiences is not always a possibility on a tight schedule. In the end, however, technical writers and the companies for which they work may face the tradeoff of spending less time designing documentation and more time assisting confused customers.

Cultural Context

Even among practicing technical writers, the cultural context, or rhetorical situation, within which the writer is working affects how he or she will view the audience. While Burnett and Lannon briefly touch upon the topic, they do not give any specific examples of ways to consider cultural context. Lannon only mentions that the reader's societal role, such as "engineer" or "manager", or country of origin is important to note. Burnett goes a bit further to say that readers in different working environments have different rhetorical needs. Apart from Sun, no other theorists even mention the subject of cultural context. It is not surprising.

There are simply too many rhetorical situations to consider, even within one company. A technical writer at MathWorks could be composing for a computer programmer or a novice user at a college like WPI; MatLab documentation is an example of the latter. A defense contractor and a software developing company have very different obligations to their customers, and the writer-reader relationships vary from company to company. Raytheon may already know plenty about their intended audience—the sailors—because their technical writers have written for that audience before. Jason Hall was a sailor himself at one point, and is a reader turned writer. This gives him the upper hand when he is conducting an audience analysis, even if invoking readers only in his head.

Certainly each rhetorical situation is a combination of many factors, including the six outlined here. Perhaps rhetoricians and instructors could incorporate some of these factors in relation to a few types of companies in their works.

Writer's Background

Sometimes technical writers simply do not have the adequate educational or professional background to perform complex audience analyses. Jason Hall obtained an unspecified Associate's Degree while in the Navy and was hired because of his experience working with boats. Scott Runstrom also explained that most of the time those composing the manuals are engineers turned technical writers.

The writer's educational and professional background is something theorists and instructors do not ever mention. Although this cannot be applied to all theorists, it seems at least some assume the writers have a strong writing background. The writer's background will ultimately influence the way in which he or she approaches audience analysis. Former engineers, like many of the technical writers at MathWorks, may assume the audience knows more information than they actually do. Conversely, a former user of the technology about which he is writing, like Jason Hall, or someone with a technical communication background might sympathize with the reader's needs a bit more. Of course in some cases, no matter what type of background the writer has, the company has predetermined standards and tools for each writer to utilize.

Information Design Tools

Companies often use certain standards or tools for designing technical documentation like Mathworks's RFAIN. Rhetoricians do not consider this very pragmatic factor when exploring audience models. Writers who work for these companies cannot simply abandon established company guidelines in exchange for audience models that work in theory. This does not mean, however, that companies should not continually explore other, more efficient information design tools to use.

It is often not practical for technical writers to read the theories of rhetoricians precisely because the companies provide formulas they may follow. But by using these established, unquestionable standards, companies might believe that someone with a strong technical background is a more able writer than a humanitarian, and that in fact any layman off the street can do it. According to Scott Runstrom, there are many companies with this mentality. Unfortunately, they run the risk of holding standards that benefit the company instead of the readers.

Writer's Lack of Control

Theorists suppose that the writer is in full control of the situation from beginning to end—before the document is even written and after the final draft is released. If instructors were to teach that there are other parties in control of the final outcome of a document, too many variables may be introduced, which could complicate the learning process. This presents another large gap between theory and practice: the writer's lack of total control. People who have control over a technical document include both others in the writer's company and readers.

Division of Labor

Parties that determine the success of the document can be other departments in the company where a technical writer works. Because of this division of labor, there is the risk of having inconsistency within the document. Engineers may want completeness in technical manuals at the expense of too much technical jargon. As Jason Hall noted, if a technical writer asks an engineer a question, the engineer can go on and on about a topic, but it is the writer's job to simplify that according to the needs of the readers. In this case, utilizing the concept of an involved audience might benefit the writer because too many engineering terms may confuse the reader, and only the readers truly know how technical is too technical for them. Even analyzing their educational background may not suffice because a degree is not necessarily a valid

indicator of a person's full knowledge base. As Sun mentioned in her usability article, there are cultural factors contributing to the usability of documents in addition to social ones.

Marketing and customer service departments sometimes let writers know what customers want, which may be different from the needs of engineers. Those interacting directly with customers, however, may not take into account that there are certain elements of the manual future users simply can't anticipate. When a company like MathWorks wishes to introduce a new feature in a program, which they do quite often, they may think about the way in which to integrate its description into a pre-existing manual. But since it is a new feature, there is only so much task-analysis that can be done. Considering an addressed audience makes the most sense in this instance for two reasons. Firstly, MathWorks may have already analyzed the audience in depth. Alternately, an in-depth analysis is simply unnecessary because there are bound to be new terms and tasks with which the user is unfamiliar and the writer cannot possibly account for everything. Each party is concerned with a different aspect of the manual which applies to their profession or cultural context.

Reader Resistance

Furthermore, it is not always in the writer's hands alone whether the document will succeed once released. Technical writers may encounter reader resistance again and again on the job. Burnett mentions the problem with people who experience limited literacy, feeling threatened by instructional manuals in general. More audience analysis may be required in these instances, to establish the types of things that intimidate the readers and what would make the manuals more accessible for them. Perhaps the writer would then need to implement a different medium altogether to present the same information.

Users who wish to use technology in a different way than the writer assumes also contribute to reader resistance. The existence of such users causes writers to lose even more control over the manuals they write and how users apply them to technology. Hence, while some rhetoricians may think that writers strongly control the content of their manuals, in reality there are many factors that are out of the writer's control.

Theory vs. Practice: Filling the Gap

Through mass media, today's rhetors can certainly reach larger audiences, so rhetorical situations may be more complex. One thing rhetoricians can learn from this study is that each theoretical model of audience is limited; no existing model accounts for the variety of practices in the working world. Theories of audience most likely apply differently to each cultural context. Perhaps more research is required into the types of practices existing in various fields, so an expanded and more complex model might emerge that can account for the variety of roles writer and readers play and the interactions between them.

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